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ÖMER GÜNGÖR
Bülent Ecevit University, Turkey

KADIR ÖZDEMIR
Bülent Ecevit University, Turkey

MODELLING THE EFFECT OF IRRIGATION ON THE HYDROLOGICAL OUTPUTS IN DARLIK CREEK WATERSHED

Abstract:

The Soil and Water Assessment Tool (SWAT) is a comprehensive, well-established, distributed hydrological cycle and continuous time model that runs the hydrological response unit (HRU) as a basic computational unit. Amount of irrigation water is automatically applied to HRU during simulation by SWAT in response to a water deficit in the soil. The SWAT-CUP is a utility program which has been adopted to carry out the parameterization, calibration, validation, and uncertainty analysis parameter uncertainty process for SWAT simulations. In this study, the hydrology of the Darlik Creek Watershed in Turkey has been modelled by the SWAT to determine effect of irrigation on hydrological outputs. SWAT-CUP has been used for calibration and validation purpose. The calibration and the validation process have been accomplished using data from one monitoring station. The model has been run for the 1976–1985 period, and while the 1981–1985 period has been used for calibration, the validation has spanned the 1976-1980 period. The monthly Nash–Sutcliffe, PBIAS and R2 (coefficient of determination) performance indicators for The Darlik monitoring station, which is located close to the watershed outlet, has shown values of 0.73, -4.6 and 0.78, respectively, for the calibration period, and 0.53, 14.6 and 0.66, respectively, for the validation period. In general, model simulation can be judged as satisfactory if NSE > 0.50, and if PBIAS 25% for streamflow (Moriasi et al. 2007). The comparison between model predictions and observations on the monthly basis for the Darlik monitoring station has indicated a good model performance. The effects of irrigation on hydrological outputs have been also investigated. Irrigation scenario has shown increases in watershed outlet stream flows by 67% for the whole year.

Keywords:

hydrologic modelling, irrigation, SWAT, SWATCup, Darlik Creek, calibration, validation